Name: _____ Class: _____ Date: _____

# 4.2 Grading the Explanations Tool: How does a cow's muscle cell use food for energy to move and function?

*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 16 points total on this worksheet.

Carbon TIME Discourse Routine around the Explanations Tool:

1. *Introduction: Students review their Evidence-Based Arguments Tools. Establish the purpose for completing the tool as developing a complete explanation for the unit phenomenon.*
2. *Private thinking and writing: Students complete the Explanations Tool individually.*
3. *Partner or small group work: Students share and compare ideas in pairs/small groups, with the goal of improving their explanations.*
4. *Sharing ideas in whole-class discussion: Class discussions serve to elicit, clarify, and compare explanations from individual students and/or student groups*
5. *Consensus-seeking discussion accompanied by public writing: Class discussions focus on coming to consensus around a correct, coherent explanation that answers the Three Questions while addressing the 4 steps. We recommend that students revise their explanations in a different colored pen/pencil.*

The Matter Movement Question

O₂
Glucose
CO₂ *H₂O*
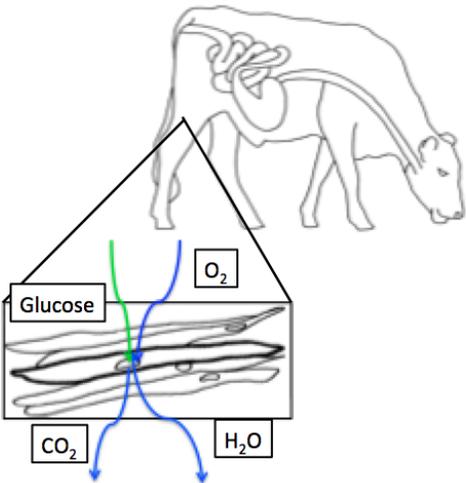
Level 4 labeled arrows
- ***Arrow labeled "glucose," "sugar," or "$C_2H_{12}O_6$" going into the cow's leg cell***
- ***Arrow labeled "oxygen" or "O_2" going into the cow's leg cell***
- ***Arrow labeled "carbon dioxide" or "CO_2" going out of cow's leg cell***
- ***Arrow labeled "water" or "H_2O" going out of cow's leg cell***

4 points total

Draw and label arrows that show molecules moving into, through, and out of a muscle cell in a cow's leg.
- Show molecules with carbon atoms moving into and out of the cell.
- Show other relevant molecules.

The Matter Change Question

Name the chemical change that allows cells to move and function: ***Cellular respiration*** *1 point*

Write the chemical equation for this change: ***$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$*** *1 point*

What molecules are <u>carbon</u> atoms in before the chemical change?
Glucose
1 point for correct answer
What <u>other</u> molecules are needed?
Oxygen
1 point for correct answer

Chemical Change

What molecules are <u>carbon</u> atoms in after the chemical change?
Carbon Dioxide
1 point for correct answer
What <u>other</u> molecules are produced?
Water
1 point for correct answer

The Energy Change Question

TIME

Energy Transformation

	What forms of energy go into this chemical change? ***Chemical energy assosciated with glucose*** *1 point for correct answer*	What forms of energy come out of this chemical change? ***Motion energy and heat energy*** *1 point for correct answer* *r*

Explain in words: How does a cow's muscle cell use food for energy to move and function? (Answer on the back).

Use this Explanations Tool to help guide your written explanation, being sure to answer the Three Questions.

Remember: **Atoms last forever** (so you can arrange atoms into new molecules, but can't add or subtract atoms).
Energy lasts forever (so you can change forms of energy, but energy can't appear or go away).

Level 4 responses should include answers to each of the four numbered steps on the Three Questions poster and handout:

1. ***Matter movement: Glucose (and other small organic molecules) come into the cell from the blood.***
2. ***Matter change: Glucose reacts with oxygen to produce carbon dioxide and water.***
3. ***Energy change: Chemical energy in glucose is transformed into motion and heat energy (and energy for other cell functions).***
4. ***Matter movement: Carbon dioxide and water leave the cell.***

1 point for each correct part of the answer

4 points total